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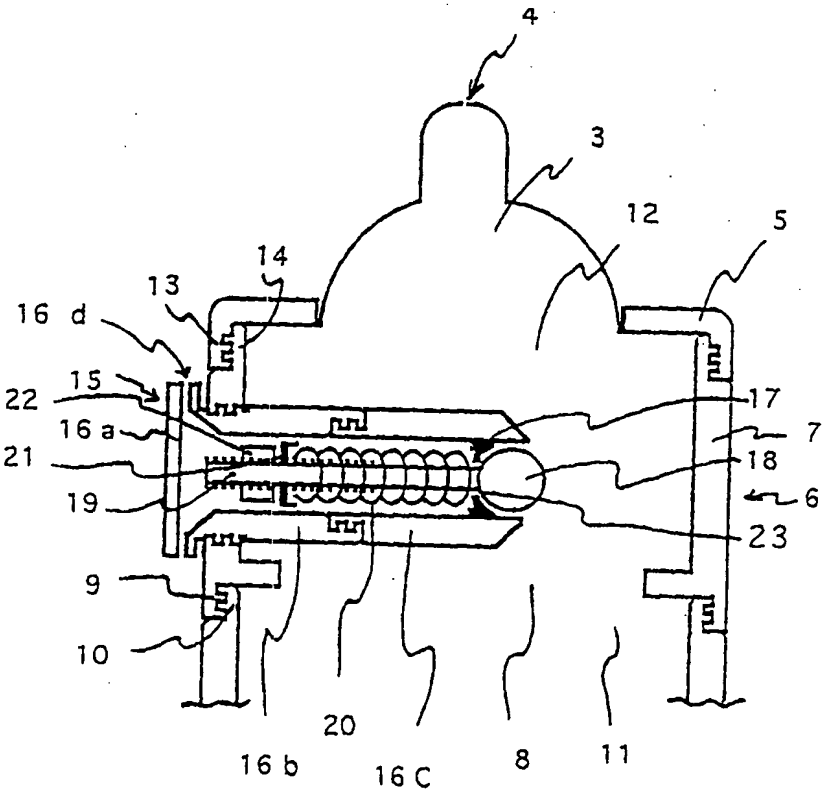
(54) Title: FEEDING BOTTLE WITH AIR INLET VALVE

(57) Abstract

Air inlet accessory for a container (1) for fluid or semisolid foods, wherein said container comprises a reservoir (2) with an outlet end (11) equipped with first fastening means (10) co-operating with second fastening means (14) on a retaining means (5) for a suction outlet means (3), characterised in that said accessory comprises a vent body (7) comprising a first opening (8) provided with third fastening means (9) which can co-operate with said first fastening means (10), a second opening (12) provided with fourth fastening means (13) which can co-operate with said second fastening means (14) wherein said vent body (7) further comprises an air inlet valve means (15).



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FEEDING BOTTLE WITH AIR INLET VALVE

The present invention relates to containers comprising a suction outlet and an air inlet valve.

When the contents are sucked from a container with a single outlet, such as, for example, a feeding bottle, a negative pressure is created inside that container. Examples of such containers which can be used, for example, for liquids and semi-solids, are baby bottles and feeding bottles for sick and handicapped people which are intended to be used in an inverted or inclined orientation and sport-bicycle bottles. Such bottles typically comprise a food or liquid containing portion (for the sake of brevity called food containing portion from now on) with a threaded or snap-fastener-equipped end opening by means of which a suitably shaped retaining ring for a suction outlet in the form of a teat or drinking straw can be releasably mounted. In such bottles, as sucking continues, negative pressure builds up inside the bottle and suction becomes more and more difficult. Ultimately further sucking becomes impossible unless the negative pressure inside the bottle is reduced by air from outside the bottle flowing into the bottle via the single outlet. As the air is sucked into the bottle to relieve the negative pressure almost inevitably some air is swallowed by the user which can lead to discomfort.

In order to avoid this problem containers have been proposed which comprise automatic one-way air-inlet valves (from now on called valves for the sake of brevity) which open when the negative pressure exceeds a desired value and thereby allow air from outside the bottle to enter the bottle.

Such containers are known from, amongst others, WO-A-9007320, which has an adjustable valve formed in a pliable membrane in the base of a cylindrical container and DE-A- 29 44 279 which has a spring loaded valve mounted in the base of a cylindrical container.

These prior art devices suffer from the disadvantage that they require specially constructed bottles as the bases of the bottles are constructed in a non-standard way. Furthermore as the valves are mounted in the base of the bottle any play which develops in the valve can lead to leakage of the contents when the bottle is standing upright and accidental activation of the valve can occur if the bottle is placed on an uneven surface. The placement of the valves in the base of the bottle has been considered desirable in order for the valve to be above the surface of the contents of the bottle when the bottle is the use position, i.e. when the bottle is inverted or inclined to the horizontal with the base upwards, in order to prevent the open valve and/or valve seat being contaminated with the contents of the bottle and subsequently failing to reseal properly.

The valve described in WO-A-9007320 suffers also from the disadvantage that repeated heating during, for example, sterilising of the bottle leads to the pliable material losing some of its elasticity which affect its function.

The valve shown in GB-A- 2 108 854 is not adjustable and hence can not be adapted to the differing suction strengths of different users.

From what has been mentioned above it is clear that there is still a strong need for a more practical and efficient air inlet valve.

The invention seeks to provide a container of the above-mentioned kind in which the disadvantages of the prior art are avoided.

In accordance with the present invention disadvantages of the prior art are reduced or eliminated by means of an accessory according to the characterising part of claim 1.

The present invention provides an accessory comprising an automatic one-way air-inlet valve which accessory is adaptable to be fitted on any feeding bottle between the food containing part of the bottle and the suction outlet retaining part of the bottle.

Advantageous effects of the invention include that since the valve is mounted near the top of the container the risk of the whole contents of the container leaking away when the container is resting on its base is eliminated. As the valve containing accessory is detachable from the food containing part of the bottle separate sterilising of the food containing part of the bottle and the valve is easily possible. If the valve containing accessory is heat sensitive it can be sterilised at a lower temperature or chemically or can be made of a cheap material and disposed of after one use. Alternatively the air inlet valve can be made easily detachable from the accessory for separate cleaning or sterilisation or disposal. Furthermore, contrary to expectations, during feeding the air sucked in when the valve is opened keeps the valve seat clean even if the valve is submerged in the contents of the bottle and thus there is no leakage during feeding.

Description of the figures:

Figure 1 shows a prior art feeding bottle without an air inlet valve.

Figure 2 shows a feeding bottle equipped with an air inlet valve according to one embodiment of the invention.

Figure 3 shows a partly cut-away schematic view of the bottle shown in figure 2.

Figures 4(A) and 4(B) show details of the air inlet valve adjusting device of figures 2 and 3.

Figure 5 shows schematically in section part of a feeding bottle equipped with an air inlet valve according to a second embodiment of the invention.

Figure 1 shows a prior art feeding bottle 1 which has a food reservoir 2 with an open outlet end (not shown) provided with first fastening means in the form of external threads (not shown), and a suction outlet means 3 which in this example is a rubber teat 3 with a hole 4. The teat 3 is retained on the reservoir 2 by a retaining means 5. In this example retaining means 5 comprises a clamping ring 5 with second fastening means in the form of internal threads (not shown) which co-operate with the first fastening means around the outlet end of the food reservoir 2 to retain the clamping ring 5 onto the food reservoir 2. Other types of fastening means using snap fittings, bayonet fittings or the like are naturally also possible.

Figure 2 shows the feeding bottle of figure 1 equipped with an air inlet accessory means 6 according to a first embodiment of the present invention.

Figure 3 shows a part section through the bottle and accessory shown in figure 2. For the sake of clarity some of the internal details have been shown enlarged and thus the figure is not drawn in proportion. The air inlet accessory means 6 has a substantially tubular vent body 7 which has an open end 8 provided with third fastening means in the form of internal threads 9 which can co-operate with the first fastening means in the form of external threads 10 around the outlet end 11 of the food reservoir 2 to retain the accessory means 6 onto the food reservoir 2. The vent body 7 has a second open end 12 provided with fourth fastening means in the form of external threads 13 which can co-operate with the second fastening means in the form of internal threads 14 on the clamping ring 5 to hold the clamping ring 5 onto vent body 7. The vent body 7 is further provided with adjustable air inlet valve means 15. In this embodiment

air inlet valve means 15 is an adjustable spring-loaded ball valve 15 which has a valve body 16 which mounted in the vent body 7 by any suitable releasable or non-releasable means for example, co-operating threads, gluing, being moulded or cast into the vent body 7, welding, snap-fastening means, bayonet coupling means. If the valve body 16 is releasably attached to the vent body 7 it can be easily removed for cleaning and returned in its place. Alternatively the valve body or parts of the valve body can be disposed of after one use and replaced by a new valve body or valve body parts. Valve body 16 comprises a cover 16a which is connected to or integral with a hollow, preferably cylindrical, upper valve part 16b. Upper valve part 16b is releasably joined to a hollow, preferably cylindrical, valve base 16c by any suitable means for example a screwed joint, a bayonet joint, a snap-fitting, etc. Cover 16 a contains at least one hole 16d connecting the hollow interior of valve body 16 with the outside. The valve body 16 contains a concave valve seat 17, a valve element 18, a valve rod 19, a helical spring 20, a graduated spring protector disc 21 and an adjustment nut 22. The valve seat 17 is provided at the inner end of the valve body 16 and has a hole 23 approximately in the centre through which the valve rod 19 passes. The valve element 18 lies in the concave side of the valve seat 17 in contact with the fluid or the air inside the vent body 7 and forms a continuation of the valve rod 19 which is provided with threads 23. The adjustment nut 22 is threaded onto the valve rod 19. The helical spring 20 is situated on the rod 19 between the adjustment nut 22 and the valve seat 17. The compression of helical spring 20 can be increased by moving the adjustment nut 22 closer to the valve seat 17.

During use due to the suction of the user, negative pressure builds up inside the bottle and reaches a certain level which is sufficient to over come the spring force holding the valve element 18 onto the valve seat 17. The valve element 18 is consequently drawn away from the valve seat 17 and the spring 20 will be compressed between the nut 22 and the valve seat 17. This will allow air to pass into the bottle through hole or holes 16d through the hollow valve body 16

to the hole 23 in the valve seat 17. There are preferably two to four holes 16d formed in the circumference or surface of cover 16a so that even if the user places one or more fingers over cover 16a there will still be at least one hole 16d uncovered. The degree of negative pressure which has to build up inside the bottle before air replacement takes place can be adjusted by the nut 22. The nut 22 can be reached by disconnecting valve base 16c from upper valve part 16b. Increasing the compression of the spring 20 results in increased pressure of the valve element 18 against the valve seat 17. Consequently, more negative pressure has to build up before air can get into the bottle and vice versa.

Although valve body 16 is show in the figures as projecting perpendicular to the vent body 7 it can advantageously be inclined towards the bottom of the food reservoir 2 so that when the bottle 1 is resting on its base fluid and food runs away from valve seat 17.

Figure 4(A) shows an embodiment of a valve rod 19 is provided with a graduated scale 24. By altering the position of the nut 22 on the rod 19, the spring compression can be adjusted to a desired value as shown on the graduated scale 24. Figure 4(B) shows a second embodiment of a graduating means in which the adjustment nut 22 is also provided with a graduated scale disk 25 which permits more accurate adjustment of the spring force. The suction force is different for each baby and it can also change with age, hence it is useful to have a sensitive and adjustable air inlet valve so that it can be altered according to the need of the user. Leakage of fluid when the bottle and vent body 7 are lying down or held upside-down is prevented because the spring force of the valve prevents any spontaneous leakage of fluid from the bottle.

Figure 5 shows a second embodiment of the invention in which the helical spring 20 of the first embodiment is replaced by a leaf spring 26. For the sake of clarity some of the internal details have been shown enlarged and thus the

figure is not drawn in proportion. The spring force is adjustable by the nut 22 in the same manner as for the helical spring 20 above.

The invention is not limited to the spring type described above and any other type of suitable spring can conceivably be used, for example, one or more elastic rubber bands or sprung washers.

CLAIMS:

1. Air inlet accessory for a container (1) for fluid or semisolid foods, wherein said container comprises a reservoir (2) with an outlet end (11) equipped with first fastening means (10) co-operating with second fastening means (14) on a retaining means (5) for a suction outlet means (3), characterised in that said accessory comprises a vent body (7) comprising a first opening (8) provided with third fastening means (9) which can co-operate with said first fastening means (10), a second opening (12) provided with fourth fastening means (13) which can co-operate with said second fastening means (14) wherein said vent body (7) further comprises an air inlet valve means (15).

2. Container (1) for fluid or semisolid foods, wherein said container comprises a reservoir (2) with an outlet end (11) equipped with first fastening means (10) co-operating with second fastening means (14) on a retaining means (5) for a suction outlet means (3), characterised in that said container (1) further comprises a vent body (7) comprising:
a first opening (8) provided with third fastening means (9) which can co-operate with said first fastening means (10);
a second opening (12) provided with fourth fastening means (13) which can co-operate with said second fastening means (14); and,
an air inlet valve means (15).

3. Accessory or container according to any of the previous claims characterised in that the valve means (15) comprises opening pressure adjusting means (19, 20, 22, 26) for adjusting the opening pressure at which the valve means (15) opens.

4. Accessory or container according to claim 3 characterised in that the opening pressure adjusting means comprises a spring (20, 26).

5. Accessory or container according to any of claims 3 or 4 characterised in that the opening pressure adjusting means comprises a helical spring (20), situated on a valve rod (19) which at one end is connected to a valve element (18) accommodated in a valve seat (17), and at the other end has a movable actuating surface (22) for adjustably compressing the helical spring (20).

6. Accessory or container according to any of claims 3-5 characterised in that the opening pressure adjusting means comprises a leaf spring (26) situated on a valve rod (19) which on at end is connected to a valve element (18) accommodated in a valve seat (17), and at the other end has a movable actuating surface (22) for compressing the leaf spring (26).

7. Accessory or container according to any of the previous claims characterised in that the air inlet valve means (15) is removably fastened into the vent body (7).

8. Accessory or container according to any of the previous claims characterised in that the air inlet valve means (15) comprises a cover (16a) with at least one hole (16d).

9. Accessory or container according to any of the previous claims characterised in that the air inlet valve means (15) is inclined towards said first opening (8).

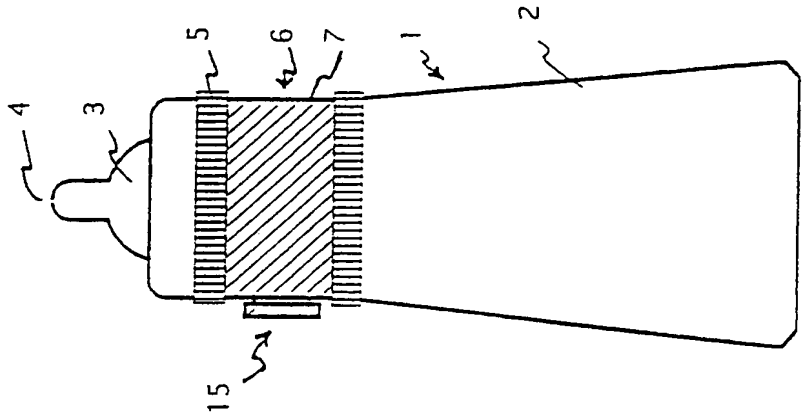

Fig. 2

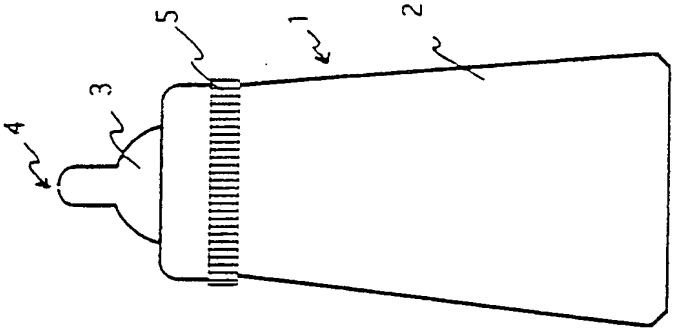

Fig. 1

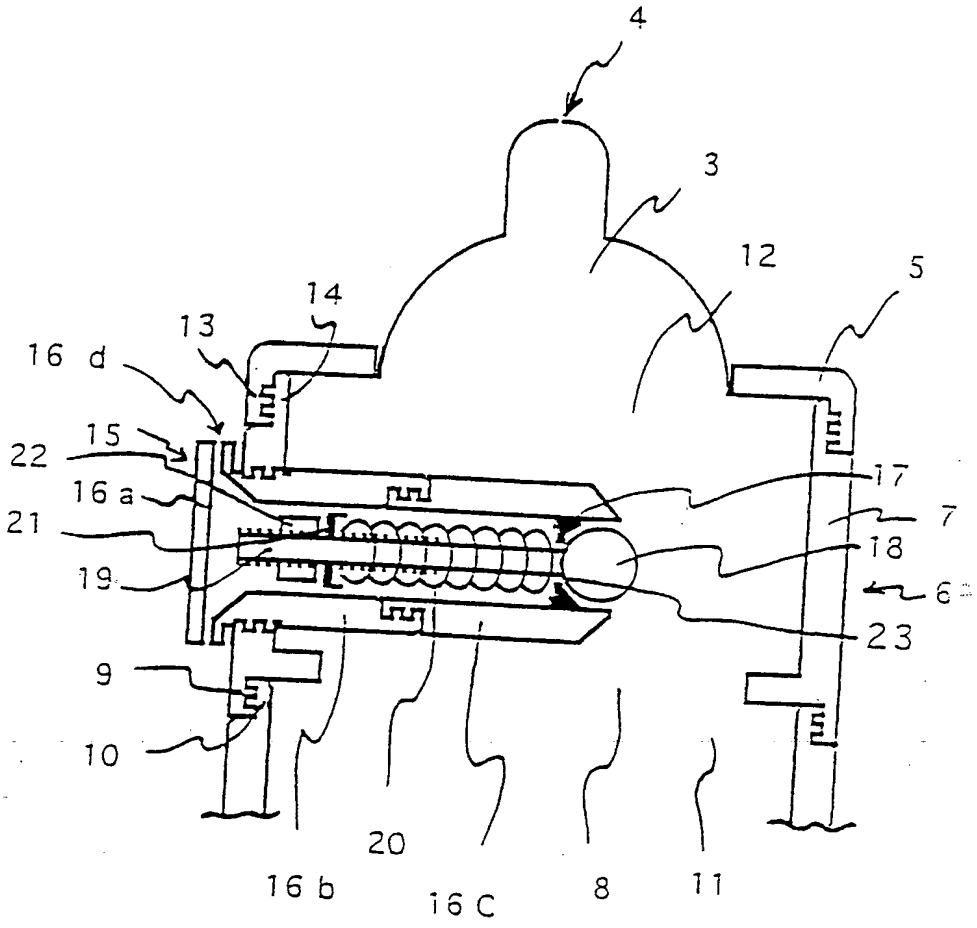

Fig. 3

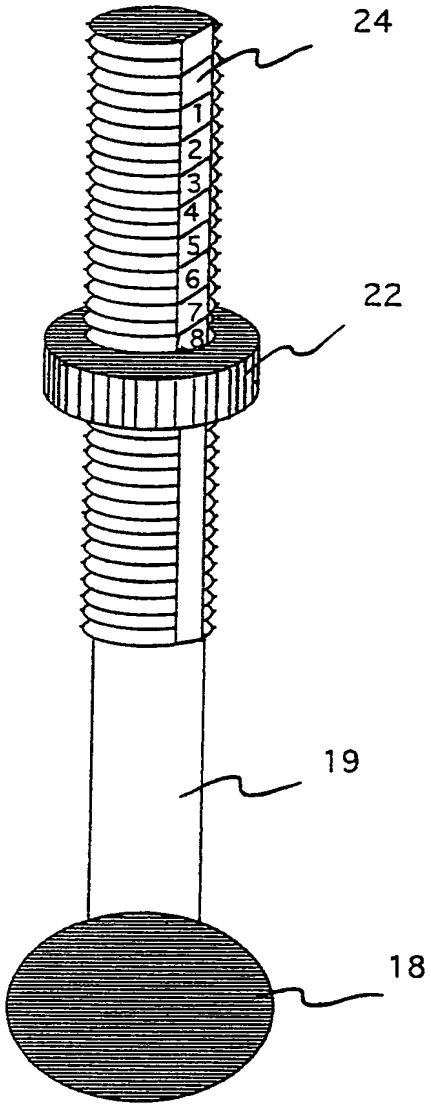

Fig. 4 (a)

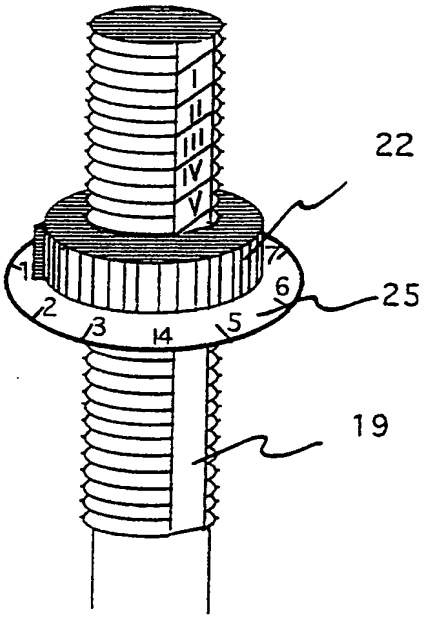

Fig. 4 (b)

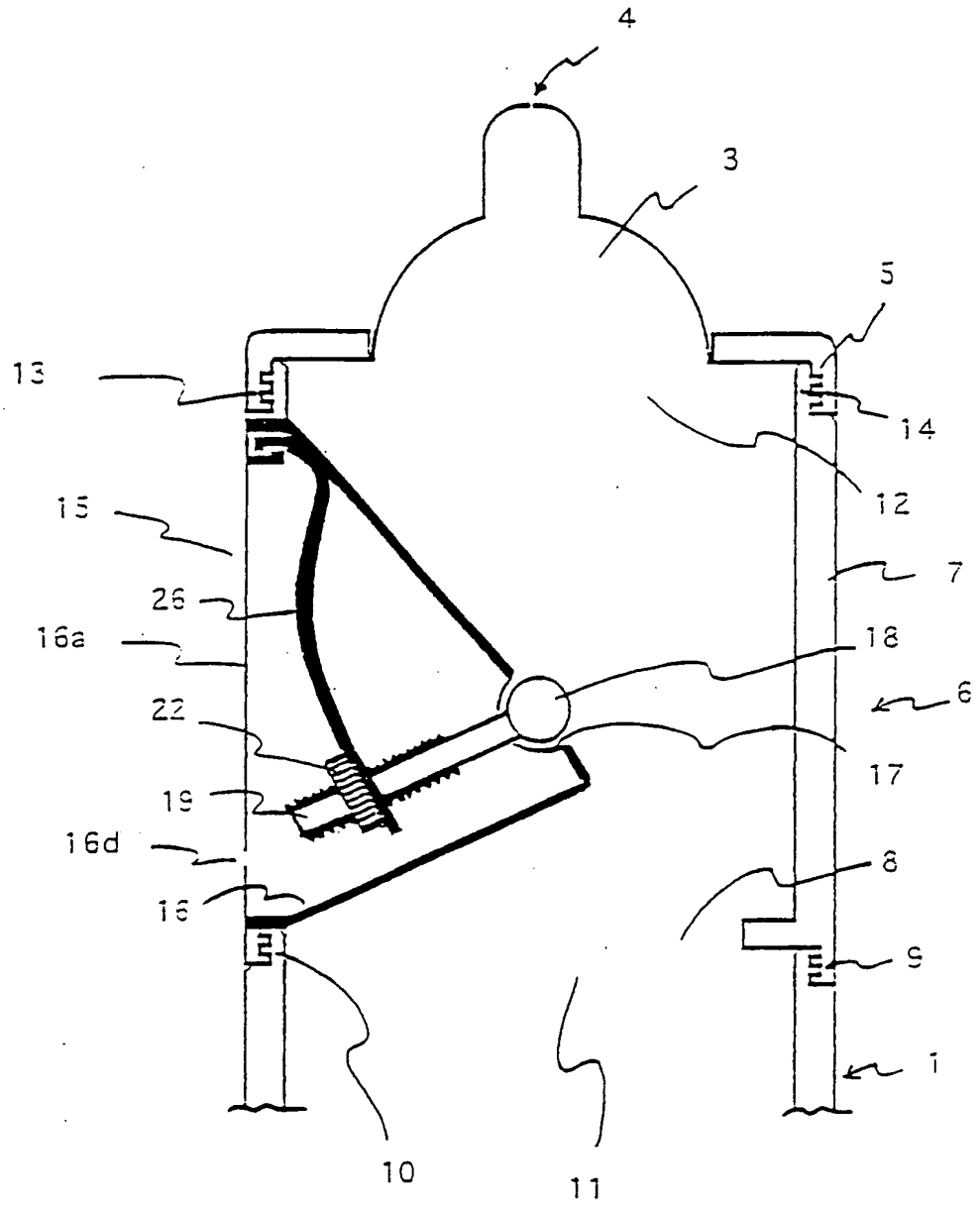

Fig. 5

INTERNATIONAL SEARCH REPORT

Int tional Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61J9/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 928 836 A (WU MIN-YU ET AL) 29 May 1990 see the whole document	1,2
A	GB 2 271 348 A (CETINDAMAR FARUK) 13 April 1994 see the whole document	1,2
A	WO 91 03225 A (GIMBLETT MATTHEW JULIAN) 21 March 1991 see abstract; figures 1,2	1,2

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Information on patent family members

Int. tional Application No
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